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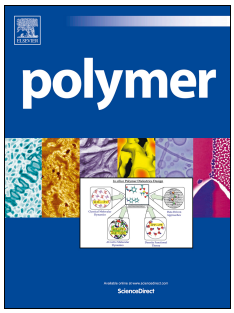

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On the structure and nucleation mechanism in nucleated isotactic polypropylene crystallized under high pressure

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ABSTRACT

Nucleating agents used for the monoclinic α-form of isotactic polypropylene (PP), commonly occurring under atmospheric pressure, are able to nucleate its crystallization in the orthorhombic γ-form under high pressure. Nucleation of γ-lamellae is possible through epitaxy involving (001)γ crystallographic plane on substrates nucleating the α-form through epitaxy engaging (010)α plane because of equivalency of both planes. Another possibility is nucleation of α-lamellae through epitaxy involving either (010)α or (110)α plane, and formation of the γ-phase through γ/α epitaxy. The study focuses on the structure and mechanism of nucleation of high pressure crystallization of PP with selected nucleating agents: poly(tetrafluoroethylene) particles, commercial Hyperform HPN-20E and ADEKA Stab NA11UH. The nucleated PP was isothermally crystallized in the γ-form under pressure of 200 and 300 MPa and studied ex-situ by WAXD, PLM and SEM. Analysis of lamellar structure provided insight into the nucleation mechanism of high pressure crystallization of PP. In all the materials the α-lamellae were nucleated first and served as seeds for the γ-form.

Keywords: nucleation; gamma-form; isotactic polypropylene